Dividends: Signaling and Managerial Control

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Contents

1 Introduction

- Do investor's demand dividends?
  - imperfect investor substitution between cash dividends and capital gains ("home-made dividends)?
  - tax differentials, illiquidity?
- Do managers prefer low dividends?
  - incentives to maintain control over "cash" reserve (free cash flow)?
  - costs of external financing given information asymmetries?
- Do managers use dividends to signal firm quality?
  - why signal with dividends as opposed to some other mechanism?
- Why do we see dividend restrictions in debt covenants?
  - precommitment device?

2 Dividend Restrictions in Debt Covenants

D_τ = dividend paid in period τ

D_τ^* = dividend "inventory" in period τ

k,F = constants, $0 \leq k \leq 1$

E_t = net earnings in period t

S_t = net proceeds from sale of new shares in period t

$$D_\tau^* = F + k\sum_{t=0}^{\tau} E_t + \sum_{t=0}^{\tau} S_t - \sum_{t=0}^{\tau-1} D_t$$

$$\textbf{The restriction}: \ \mathrm{D}_\tau \leq \max[0, \ \mathrm{D}_\tau^*]$$

Note: This dividend restriction, coupled with the cash flow identity (outflows equal inflows) also implies a restriction on the firm's investment- and financing policy, provided the firm wants to pay dividend.

Why?

$$D_t + R_t + P_t + I_t \equiv \Phi_t + S_t + B_t$$

where

R_t = interest paid in period t

P_t = downpayment of principal

I_t = investment outlay

Φ_t = period's cash inflow

B_t = proceeds from sale of bonds in period t

$$\Phi_t \equiv E_t + d_t + R_t + L_t$$

d_t = depreciation allowance in period t

L_t = proceeds from liquidation of assets

By substitution:

$$D_t = E_t + d_t + R_t + L_t - I_t + S_t + B_t - R_t - P_t$$

Simplify: $G = 0$ for $t \neq 0$, $P_t = 0$ for $t \neq T$, and $F = k = 0$:

$$\Longrightarrow B_0 \leq \sum_{t=0}^{\tau} (I_t - L_t - d_t)$$

In other words, the *dividend* restriction implies that the firm cannot pay dividend in period τ unless the cumulative change in the *book value* of the firm's assets after the initial debt issue exceeds the proceeds from the debt issue.

If we allow for additional debt issues and repayments of principal,

$$\Longrightarrow \sum_{t=0}^{\tau} (B_t - P_t) \leq \sum_{t=0}^{\tau} (I_t - L_t - d_t)$$

3 Dividends as an Information Signaling Mechanism

The following example, which is in the spirit of Miller and Rock (1985), illustates how dividend policy can be used to signal firm quality. Will see that the signal is costly as it results in an underinvestment problem

- Firm has random cash flow of X_1 at date 1, where X_1 is either 100 or 80 with equal probability.
- Firm invests at date 1. Can:
  - invest a lot: $I_1 = 40; X_2 = 70$ (NPV=30, first best)
  - invest a little: $I_1 = 20; X_2 = 40$ (NPV=20)
  - invest nothing: $I_1 = 0; X_2 = 0$ (NPV=0)
- Dividends paid at date 1: $D_1 = X_1 - I_1$ (If the firm borrows, D_1 is the net dividend, gross dividend minus borrowing)

I. Case with Symmetric Information:

- Everyone sees X_1, I_1, D_1
- Stock prices at date 1:
  - *Good state:* Firm invests 40, pays dividend of 60 (100-40), and has project payoff of 70 on average. Firm value is 130, as is the cum-dividend stock price P_1.
  - *Bad state:* Firm invests 40, pays dividend of 40 (80-40) and project pays off 70. Firm value is 110 as is cum dividend stock price.
- No inefficiency here.

II. Case with Asymmetric Information:

- Suppose shareholders can't observe X_1 and I_1, only D_1.
- If market believes that the firm follows the above symmetric information dividend policy, then:

$$P_1(D_1 = 60) = 130$$

$$P_1(D_1 = 40) = 110$$

- So a dividend announcement of 60 should be met with a price increase from 120 to 130, whereas a dividend announcement of 40 should be met with a price drop to 110.
- Can this be an equilibrium?

<u>Intuition</u>:

- In the above, suppose that managers care about *current* stock price, not just long-run value. Then a bad manager can pay a dividend of 60 so that the market believes that the firm is worth 130, driving the price up.

- Of course, by raising the dividend to 60, the firm can invest no more than 20 so long-run value falls to 100. But, if the manager cares a lot about P_1, he will have an incentive to increase the dividend, destroying the putative equilibrium.

- Under symmetric information, maximizing P_1 and firm value are one and the same. Now, they are clearly different.

- Suppose manager maximizes

$$U = \alpha P_1(D_1) + (1-\alpha)[D_1 + F(X_1 - D_1)]$$

  where F is the investment function and α is the weight on current stock price and $1-\alpha$ is the weight on firm value.

- Note: $\alpha = 0$ is the firm-value maximizing case $\longrightarrow$ efficient investment outcome (since only care about long-run value).

- Rationale for $\alpha > 0$:
  - Shareholder objective if α is the probability they sell at date 1 or there is a takeover. Then old shareholders gain from the higher selling price.
  - Manager objective if α is the probability that he is fired at date 1 and has stock-based compensation. Managers want high P_1 to fend off takeover threat.
- Suppose $\alpha = \frac{1}{2}$
  - $\Longrightarrow$ Then the efficient outcome is no longer an equilibrium. By paying dividend of 60 rather than 40, the bad manager's expected utility is

$$\frac{1}{2}130 + \frac{1}{2}100 > 110.$$

The LHS is the expected utility when $D_1 = 60$ and the RHS is the expected utility when $D_1 = 40$.

What then is the equilibrium?

- Suppose good firm increases dividend from 60 to 80 and cuts investment from 40 to 20. Bad firm leaves dividend at 40. Then $P_1(D_1 = 80) = 120$ and $P_1(D_1 = 40) = 110$. Bad firm will not attempt to mimic the good firm if

$$110 \geq \alpha 120 + (1 - \alpha)80,$$

where 120 i sthe stock price if viewed as good and 80 is the value of the bad firm if $I_1 = 0$. This condition is met if $\alpha = \frac{1}{2}$.

Will a good firm want to mimic a bad firm?

- Not if:

$$120 \geq \alpha 110 + (1 - \alpha)130,$$

where 110 is the stock price if viewed to be bad and 130 is the value of the good firm if $I_1 = 40$.

- This condition is satisfied if $\alpha = \frac{1}{2}$.
- So there is a separating equilibrium in dividend policy that is informative, yet economically inefficient.

- Basic idea: Dividends are a credible signal of firm quality because they cost bad firms more than good firms (in terms of reduced investment). Bad firms do not mimic good firms because to do so, they must cut their investment by a lot, thus reducing future value a lot.

Pros of the signaling argument

- Dividend increases raise stock prices in line with empirical evidence (although not on earnings)
- Greater concern for current stock price leads to more dividends (Japan vs. US).

Cons of the signaling argument:

- Dividends signal information about *current* cash flow which is assumed to be unobservable. Perhaps better to focus on signal of future cash flow [Bhattacharya (1979)]. However, a problem with dividends as signals of future cash flows as it is hard to commit to a future dividend policy.

4 Dividends and Managerial Control

Dividends and ownership structure:

- The tax penalty on dividends appears insufficient to cause shareholders to sell out when dividends are raised:
  - No detectable correlation between dividend yield and expected stock return
  - Little or no clientele change in response to large, unexpected dividend increases
  - Reluctance to sell due to trading frictions and loss of diversification and control benefits?
- Implication:
  - Tax clientele argument appears inconsistent with observed ownership structures
  - Large, informed shareholders tend to prefer stock repurchse over cash distribution
  - Internal shareholder disagreement over dividend can be expected

Eckbo and Verma (1994): Voting Power and the Consensus Dividend Policy

- Basic premise: With a stable shareholder clientele, internal disagreement over policy are resolved through voting
- Defines a consensus -or compromise- dividend which resolves this disagreement
- Shows how the consensus dividend is linked to the distribution of shareholder voting rights
- Tests performed on the Toronto Stock Exchange (TSE). Advantages of TSE:
  - Managerial shareholdings substantial and stable
  - Corporate/institutional shareholdings also substantial and stable
  - The two shareholder groups have clearly conflicting interests, both due to taxes and free cash flow considerations

<u>A simple one-period decision process</u>

Process fits stylized facts:

- Side-payments are illegal

  $\Longrightarrow$ model assumes a non-cooperative game structure

- Actual dividend votes rare

  $\Longrightarrow$ model assumes costly voting with uncertain outcome

- Management keeps track of shareholder identity

  $\Longrightarrow$ model assumes Management is endowed with informational advantage and the lowest costs of voting

Game structure

- Two major players: manager-owners (m) and corporate owners (c)
- A third group consisting of a large number of small, individual owners (the "ocean")
- c proposes a dividend D to m
- m receives private info on the probability p that c will win a shareholder vote (if held). The distribution F over the private signal is common knowledge.
- m accepts or rejects D. If reject, c calls for a vote between D_c proposed by c and D_m proposed by m. The range $D_c - D_m$ depends on optimal dividend policy
- The costs to c and m of participating in the vote is k_c and k_m, with $k_m < k_c$.

<u>Remarks:</u>

- The outcome of the vote is unknown due to unknown preferences of small shareholders
- The costs k_m and k_c act to discipline the two players much in the same way that litigation costs affect a plaintiffs litigation and settlement decision.
- The costs k_c and k_m play a central role:
  - If $k_c = k_m = 0$, m accepts D only in those states where m's private information indicates that c would have been better off calling the vote. Knowing this, c's dominant strategy would be to propose D_c, always forcing the vote.
  - However, $k_c > 0$ modifies c's behavior (causes a proposal $D < D_c$) because k_c can be avoided through a compromise with m.
  - $k_m > 0$ increases number of states where m accepts c's proposal $D > D_m$.

Main Proposition:

$D_m < D^* < D_c$ *and* $\partial D^*/\partial p > 0$

- Sketch of Proof: Let $V_c(D) = D$ and $V_m(D) = -D$
- m's expected costs of forcing the vote: $pD_c + k_m$.
- Thus, m accepts D iff

$$p \geq \frac{D - k_m}{D_c} \equiv p^*$$

  - $D = k_m > 0$ always satisfies this, and represents the minimum D that c will propose
  - Given k_m and D_c, the greater p, the greater the D acceptable to m

- c selects D so as to maximize $E[V_c]$,

$$E[V_c] = [1 - F^*]D + F^*[\delta D_c - k_c],$$

where δ is the expected probability that c will win the vote conditional on rejection by m of the proposal D, i.e.,

$$\delta = \frac{\int_0^{p^*} pf(p)dp}{F^*}$$

- We show that $E''[V_c] < 0$
- Interior optimum (the consensus dividend):

$$D^* = p^* D_c - k_c - [\frac{F^* - 1}{F^{*\prime}}]$$

Empirical Analysis

- 308 TSE-listed firms from 1976-1988 (1558 firm-years)
- 68-80% of the sample firms pay cash dividends annually.
- The average dividend yield ranges from 3-5%.
- in 1988, 211 sample firms paid a total of $9.4 billion in cash dividends.
- Average ownership proportion of c is 31-35%, of m is 25-31%
- Use c's "Shapley-value" (ϕ_c) as a proxy for the probability p.
- The Shapley value is a non-linear function of c's ownership proportion, which depends on the ownership proportions of m and s.
- When $\phi_c = 1$, corporate shareholder has absolute voting control), and $\phi_m = 0$ and $D = D_c$. There are 77 such firms in the sample (554 firm-years), all paying dividend.
- When $\phi_m = 1$ managers have voting control, $\phi_c = 0$ and $D = D_m$. There are 63 such firms in the sample (403 firm-years). Only 16% of these paid dividend, suggesting $D_m = 0$

- Four Empirical Approaches

  - (1) Simple regression of dividend yield on ownership structure, pooling all the data
  - (2) Simultaneous estimation of dividend yield and ownership structure using panel data where neither c nor m have voting control
  - (3) Regression tests on non-absolute-control sample with instruments for D_m and D_c estimated on absolute-control samples
  - (4) Linear factor analysis (LISREL), again pooling all the data

A LISREL Procedure

- *Measurement model*:

$$x = \mathbf{\Lambda}\xi + \delta$$

where x is a 9×1 vector of observable characteristics, ξ is the 3×1 vector of the unobservable factors (D_m, D_c, ϕ), and Λ is the 9×3 matrix of factor loadings.

- *Structural model*:

$$d = \Gamma\xi + \epsilon$$

where Γ is the 1×3 vector of factor loadings.

- Maximum likelihood, minimizing

$$log(det\mathbf{\Sigma}) + tr(\mathbf{S}\mathbf{\Sigma^{-1}}) - log(det\mathbf{S}) - (p + q)$$

where $q = 9$

$p = 1$ is the number of dependent variables in the structural model

$\mathbf{S}$ is the covariance matrix of $\mathbf{x}$ and D

$\mathbf{\Sigma}$ is the corresponding covariance matrix implied by the model

- The procedure assumes ϵ and δ have diagonal covariance matrixes, and that ξ has a conditional multinormal distribution

- 46 parameters (27 in Λ, 3 in Γ, 6 in covar. matr. of ξ, 9 variances of δ, and var(d)).

- Thus, system is underidentified. To achieve identification, we impose 16 parameter restrictions (0's and 1's) on the factor loadings in Λ (table 9). Thus r=46-16=30 parameters must be estimated.

B Shapley Values

- Shapley value developed for so-called 'oceanic' (cooperative) games.

- An oceanic game is characterized by the presence of n large shareholders each controlling a fraction w_i, $i = 1, ..., n$ of the total number of votes, with the remaining fraction $w_0 = 1 - \sum_i w_i$ controlled by a large set of small players.

- In our case, there are two major players: owner-managers who control w_m of the votes and corporate/institutional owners who control w_c, with the 'ocean' represented by the firm's remaining small shareholders.

- Player i's Shapley value, ϕ_i, represents i's expected value from participating in the game, given all possible coalitions S of $s < n$ players that i can join in order to win the vote, and given that the coalition wins because player i joins.

- Thus, player i has voting power only to the extent that i is pivotal in determining the outcome of the vote.

- For operational purposes, assume that the value $v(S)$ to coalition S of playing the game is 1 if S wins the vote, and 0 if S loses. This assumption is obviously restrictive within the dividend taxation/agency cost framework. However, it is consistent with the assumed absence of side payments between players and, more importantly, it allows computation of the Shapley value without explicit knowledge of the generally unobservable value function v.

For each major player i, the value of the game, as the number of players $\longrightarrow \infty$, converges to

$$\phi_i = \sum_{S \subseteq N-\{i\}} \int_{t_2}^{t_1} p^s (1-p)^{n-s-1} dp,$$

where N is the set of all major players, $\{i\}$ is the set containing major player i only, s is the number of major players in coalition S, $w(S) = \sum_{i \in S} w_i$ is the fraction of the votes controlled by the major players in set S, p is a continuous variable on $[0,1]$, and the integral limits $t_1 =< \frac{\alpha - w(S)}{\omega_0} >$ and $t_2 =< \frac{\alpha - w(S \cup \{i\})}{\omega_0} >$ are such that

$$< t >= \begin{cases} 0 & \text{if} \quad \mathrm{t} \leq 0 \\ t & \text{if} \quad 0 \leq \mathrm{t} \leq 1 \\ 1 & \text{if} \quad \mathrm{t} \geq 1, \end{cases}$$

and where $\alpha = 0.5$ is the fraction of the votes needed to win the vote in a simple majority game.

Furthermore, the value of the game for the ocean as a collective is given by

$$\phi_0 = 1 - \sum_{i \in N} \phi_i$$

<u>Intuition:</u>

The integrand is the probability that a coalition S of s major players will form (playing against the coalition of the remaining major players in a simple yes-no vote), while the integral limits constrain the value-added of player i to those coalitions S where i is pivotal for that coalition to win the vote. The Shapley value is then the sum of the value-added from all possible coalitions where i may be pivotal.

Following the above we have that

$$\phi_m = \begin{cases} \\ \frac{w_m}{w_0} - \frac{w_m w_c}{w_0^2} & \text{if } w_0 \geq \frac{1}{2} \\ \frac{(1-2w_c)^2}{4w_0^2} & \text{if } w_0 \leq \frac{1}{2}, w_m \leq \frac{1}{2}, \text{ and } w_c \leq \frac{1}{2} \\ 1 & \text{if } w_m \geq \frac{1}{2} \\ 0 & \text{if } w_c \geq \frac{1}{2} \end{cases}$$

where, as before, w_0 denotes the ownership proportion of the large group of non-managerial, individual shareholders. The computation of ϕ_c is identical (with the appropriate switch of w_m and w_c), and the Shapley value of the

'ocean' is $\phi_0 = 1 - \phi_m - \phi_c$.
Examples of Shapley values for simple majority games. There are up to three major players ($i = 1, 2, 3$) in addition to the ocean ($i = 0$), none of which have absolute voting control:

Ownership proportion ω_i				Shapley value ϕ_i			
w_1	w_2	w_3	w_0	ϕ_1	ϕ_2	ϕ_3	ϕ_0
.05	-	-	.95	.053	-	-	.947
.10	.30	-	.60	.083	.417	-	.500
.40	.40	-	.20	.250	.250	-	.500
.05	.40	.40	.15	.160	.272	.272	.296

As shown,

- The Shapley value of each player is nonlinear in the player's ownership proportion and it depends on the distribution of ownership across all shareholders
- For example, in the second and third case, the Shapley value of the ocean of small players is .5 whether the ownership proportions of the two remaining large players are either (.10, .30) or (.40, .40)
- Furthermore, even if the ownership proportion of the ocean drops to .15, its Shapley value remains significant provided none of the two other players have absolute control

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